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Ms. Stephany Powell Coker
Secretary to the Commission
Public Service Commission of Wisconsin
610 North Whitney Way
P.O. Box 7854
Madison, Wisconsin 53707-7854

RE: Wisconsin Power and Light Voluntary Programs Docket No. 6680-EE-2022

Dear Secretary Coker:

Enclosed is the Wisconsin Power and Light 2022 Energy Efficiency Volunteer Plan. WPL requests that the Public Service Commission of Wisconsin review and approve this plan so that WPL can implement it starting as of January 1, 2022.

If you have any questions on the proposed program, please contact Jeff Adams, Lead Customer Program Manager, 608-458-8419; JeffAdams@alliantenergy.com.

Sincerely,

/s/ Brian Penington
Brian Penington
Manager Regulatory Affairs
Wisconsin Power and Light Company

Wisconsin Power and Light Voluntary Program Update

Docket: 6680-EE-2022

7/1/2021

2018 Voluntary Program Filing (Original): July 3, 2017 (6680-GF-133; PSC REF#: 327181)
2019 Voluntary Program Filing: June 29, 2018 (6680-EE-2019; PSC REF#: 345392)
2020 Voluntary Program Filing: July 1, 2019 (6680-EE-2020; PSC REF#: 371373)
2021 Voluntary Program Filing: June 30, 2020 (6680-EE-2020; PSC REF#: 392854)

Voluntary Program Name: Enhanced Low-Income Weatherization Program

Program Description

The Wisconsin Power and Light Company (WPL) Enhanced Low-Income Weatherization Program (ELIWP) is available to natural gas customers who are homeowners and are below 80% of the state median income (SMI). ELIWP is designed to address the energy efficiency of the entire home (e.g., heating system, building envelope, low cost energy efficiency measures, etc.)

A Focus on Energy Trade Ally conducts an initial assessment and recommends a work plan. The Trade Ally installs relevant Focus on Energy direct installation measures as well as applicable added measures, which are supported wholly by WPL (up to $8,000/home). Additional measures provided by WPL may include:

- Sill box insulation
- Air infiltration not included under Focus incentive e.g. hole in external door, broken glass on external window
- Furnace and boiler tune-ups and repairs
- Other natural gas appliance repair or replacement, if needed, for health/safety purposes due to enhanced air sealing
- Carbon Monoxide Detector
- Direct install LED bulbs

There is no advertising of the program, which eliminates any confusion there might be with other weatherization programs (e.g., Focus on Energy and State Low Income Weatherization). WPL is modeling this program around the success of the We Energies Residential Assistance Program (RAP).

Status Update

ELIWP program launch work began in early 2018. The first six to nine months were focused on identifying home owners that met income qualifications, as well as appropriate Trade Allies. WPL conducted multiple meetings to negotiate contracts and insurance requirements with selected Trade Allies. Final agreements were signed in January of 2019. Recruitment letters were sent out immediately in batches of 50 customers for each Trade Ally.

Initial response rates were very low. Alliant Energy conducted follow-up calls to the customers who did not respond and found that participation was challenged for nearly 30% of letter recipients by language barriers. Alliant Energy met with Focus on Energy staff to explore ways of reaching customers that have

a language barrier and was informed that efforts are underway to provide translations of Focus on Energy websites and marketing materials, as well as to enlist bilingual Trade Allies.

The program has an opt-in design. Interested customers who receive an offer letter are invited to contact their assigned Trade Ally to schedule an initial evaluation. These evaluations provide an estimate of energy savings available for each customer through applicable weatherization measures. Once approved, the Trade Ally schedules and completes the work. A total of 30 homes were completed in 2019, 43 in 2020, and 23 so far in 2021.

WPL estimates that there are nearly 3,000 homeowners that could qualify for this program. Although launching the program took several months, WPL has continued to enroll participants over the last two years and, despite the pandemic, has achieved more than its original goal of 50 participants. WPL hopes to continue to offer this program to income-qualified participants during the 2022 program year.

A recent process evaluation of this program finds that ELIWP achieves very high customer satisfaction ratings (9.5 out of 10). Other evaluation activities include stakeholder interviews and a review of program materials. Complete evaluation results can be found in Docket 6680-EE-2021, PSC REF# 414799

Budget

The 2022 Enhanced Low-Income Weatherization Program will primarily be supported by unspent funds from prior program years. To support increased participation goals and added outreach, WPL requests an additional $246,000 for the 2022 program year.

Voluntary Program Name: Home Energy Monitoring Pilot

The following provides an update on the status of the Home Energy Modeling Pilot currently offered by WPL and outlines a plan to continue this research as part of the 2022 Energy Efficiency Volunteer Plan.

Program Description

In 2018, WPL and Cadmus began conducting an exploratory pilot to investigate the potential benefits of customer-facing, broadband, device-level energy monitors. These monitors provide customers with real-time information on home energy usage, including the use of individual devices, which is displayed through an online platform or a smartphone app. The pilot originally targeted customers in rural areas to determine the feasibility of mitigating some of the inequities in cost and access that have traditionally resulted in rural customers being underserved by Focus on Energy programs.

Residential customers were provided a free Sense monitor in exchange for participating in the program and sharing their monitor data. The pilot had three primary objectives: derive estimates of the energy savings achievable through the replacement or servicing of inefficient equipment; drive behavior-based energy savings by increasing a homeowner's awareness of their energy use; and assess the potential impact of time-of-use rates and demand response initiatives by providing detail on customer energy usage patterns.

The first 100 monitors (Phase I) were installed in rural areas of Wisconsin during the summer of 2018, to align with the Commission's interest in improving rural customers' access to energy efficiency programs. In a second phase of the pilot, an additional 100 monitors were installed to construct a more

representative sample of Alliant Energy customers. The combined sample of 200 monitors installed in Phase I and Phase II was designed to approximate the overall rural/urban distribution of customers in WPL territory.

Phase III was designed with the added goals of investigating the effects of targeted messaging on energy use among program participants, as well as testing a second disaggregation technology. Phase II and Phase III monitor installations were delayed somewhat by the COVID-19 pandemic, however all installations for these phases have now been successfully completed. A combined evaluation of all installed monitors was conducted, and selected results from a recently filed report (July 1, 2021; Docket 6680-EE-2021; PSC REF# 414864 are described below.

Recruitment of income-qualified participants for Phase IV is underway. Installations for this phase are expected to begin in August.

Status Update: Home Energy Monitoring Pilot Phase I

Phase I recruitment, installations, and evaluation were completed in 2019. The team continues to collect data from Phase I monitors and incorporate them into subsequent evaluation reports. There are no funds remaining in the Phase I budget.

Status Update: Home Energy Monitoring Pilot Phase II

Phase II recruitment and installations began in mid-2019. Sixty-four installations were completed prior to the onset of the COVID-19 pandemic. The remaining monitors were installed in late 2020 and early 2021.

Phase II is very close to completion. The final task of this phase is to identify and replace up to five inefficient devices, then measure the energy savings directly through the Sense data. Four inefficient devices have been identified for potential replacement (refrigerator, freezer, water heater, and AC). Of these, two have been replaced, one is in the process of replacement (pending appliance availability and/or contractor scheduling), and we are in communication with the fourth participant. The Phase II budget will be exhausted by the end of the appliance replacement process.

Status Update: Home Energy Monitoring Pilot Phase III

Due to the COVID-19 pandemic, Phase III Sense monitor installs did not begin until the fall of 2020. However, installation of Sense monitors for Phase III is complete. The alternate Energy Cloud technology has proven difficult for customers to self-install; Cadmus is working with Blue Line Innovations to troubleshoot this process and may send technicians to assist in the installation process. So far, 15 Energy Clouds have been installed.

A customer messaging campaign targeting three avenues for enhanced energy savings is scheduled to begin in July. The three opportunities for enhanced energy savings are:

- Connecting participants with relevant Focus on Energy programs;
- Identifying high-consumption household devices that may warrant replacement; and
- Reducing customers' always on load.

Evaluation of the impacts of these messaging campaigns will be included in the June 2022 report. Findings and recommendations derived from completed Phase II and Phase III installations were

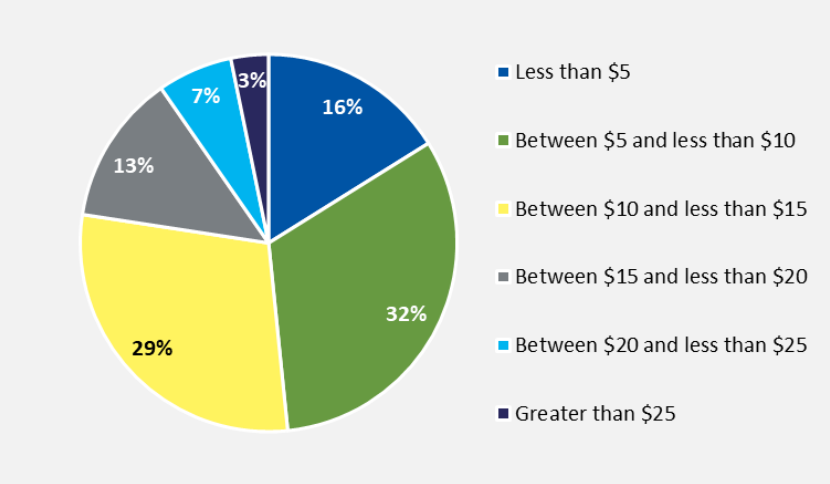
submitted to the Public Service Commission of Wisconsin (PSC) in an evaluation report on July 1, , 2021 (Docket 6680-EE-2021; PSC REF# 414864 A subset of those evaluation results is presented below.

Process Evaluation

A survey of Sense Home Energy Monitor Pilot participants asked respondents to rate their satisfaction with the pilot application process, the Sense monitor, the pilot, and Alliant Energy. Respondents reported an *easy* (97%) sign-up experience (*N*=126 respondents). They also reported satisfaction with the length of time it took for the Sense monitor to be installed after their application was submitted (97%, *N*=120) and the technician who installed the Sense monitor (99%, *N*=108). These satisfaction metrics have become more positive (a higher percentage of positive participant response) with each phase of the pilot.

Of 126 respondents, 29% said they saw a decrease in their monthly energy costs since accessing the Sense Monitor or Energy Cloud app. Of these 37 respondents, 61% noticed a decrease between $5 and $15 (as shown in Figure 1). Ninety-five percent of respondents were satisfied with the decrease in energy costs after accessing the apps (n=37).

Figure 1: Monthly Energy Cost Savings



Source: Cadmus Survey question B10. "By about how much did your monthly energy costs decrease?" (n=31)

Cadmus asked respondents to rate their satisfaction with the Home Energy Monitor Pilot and Alliant Energy using a scale of 0 to 10, where 0 is *not at all satisfied* and 10 is *extremely satisfied*. Respondents reported a mean satisfaction rating of 8.5 for the pilot and 8.9 for Alliant Energy. The survey also asked respondents if their opinion of Alliant Energy had changed since participating in the pilot. Over half (57%, *N*=124) said their opinion of Alliant Energy had improved.

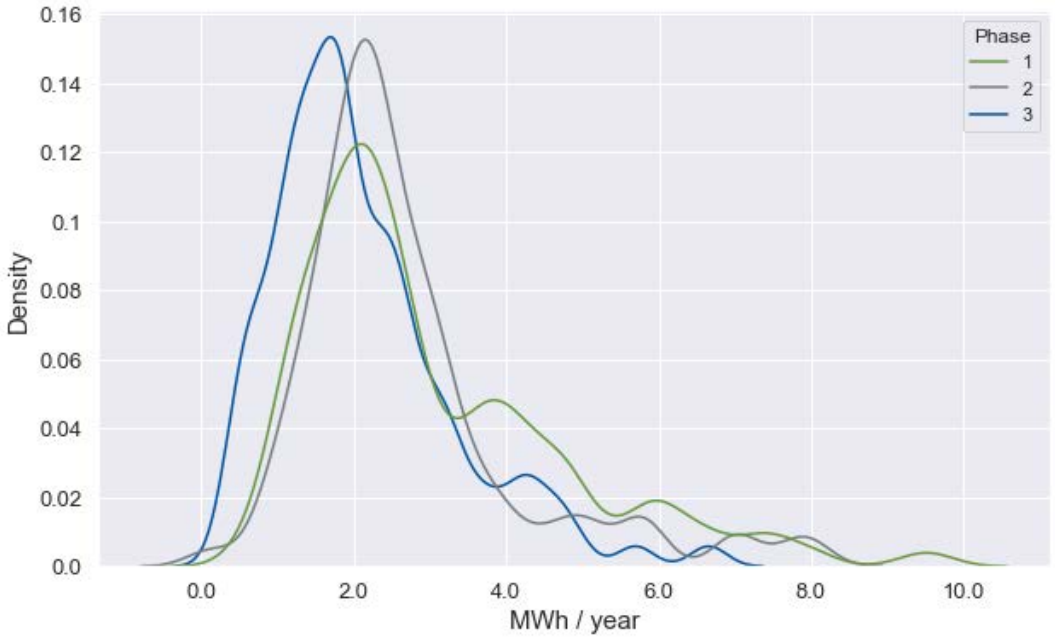
Impact Evaluation

"Always On" Savings Potential

"Always On" loads are from devices that are plugged in and draw current and power despite not being actively used 24 hours a day, such as televisions or hot water kettles. One of the research questions of

Phase III was to determine whether high overall household energy use is associated with high "Always On" load (as opposed to discreet, inefficient appliances). Participants for Phase I and Phase II were chosen from a pool of higher-than-average energy use homes, and Phase III participants were chosen from a pool of average energy use homes. Figure 2 shows that "Always On" load is, on average, higher for Phase I and Phase II participants. This finding suggests that programs offering smart strips as measures would achieve higher savings by targeting high energy use customers.

Figure 2: "Always On" Density by Pilot Phase



Appliance Replacement Study

The Phase II scope included evaluation of the potential for Sense monitors to be used for identification and targeted replacement of grossly inefficient appliances. Cadmus focused on appliance types that typically have high annual energy consumption: refrigerators, freezers, electric water heaters, clothes dryers, and air conditioners. We used Sense monitor data to identify candidate appliances that were in the top 5% of energy consumption among appliances of the same type within the pilot sample. Customers with candidate appliances were offered an incentive to replace their inefficient appliance with a qualifying efficient model.

Freezer Replacement

Cadmus completed an appliance replacement with a freezer, installed on May 31, 2021. This customer was selected for replacement because Sense data indicated extremely high usage for a particular refrigerator/freezer device. Upon contacting and receiving more information about the appliance, we determined it was a freezer model dating back to the 1970s.

In addition to offering an incentive for freezer replacement, we communicated to the participant that they had an additional freezer that exceeded typical annual consumption levels. The participant replaced their main freezer and had an additional underperforming freezer removed. For the newly installed replacement freezer, initial Sense data suggests an annual consumption of 215 kWh. Table 1

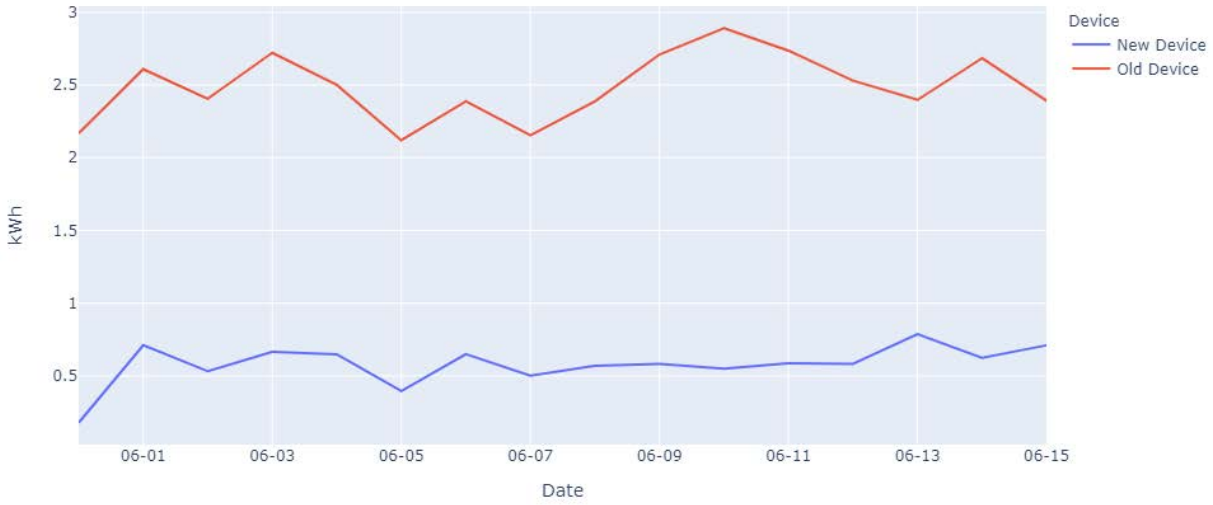
contains the estimated annual consumption for the original and the newly installed freezer. The replacement and discard are expected to reduce this customer's energy consumption by 889 kWh/year.

Table 1. Freezer Replacement Impact

Device	Operating Dates	Estimated Consumption [kWh/year]
Original Freezer	January 27, 2020 – May 19, 2021	827
Discarded Extra Freezer	January 27, 2020 – May 30, 2021	277
Replacement Freezer	May 31, 2021 – Present	215
Estimated Annual Savings		**889**

Figure 3 depicts daily freezer consumption in June 2020 and June 2021 for the old and new devices, respectively.

Figure 3. Freezer Replacement Consumption Comparison – 2020/2021 Juxtaposition



A more exhaustive list of findings with associated conclusions and recommendations can be found in the evaluation report.

Remaining tasks to complete Phase III: Energy Cloud installs, conduct and analyze resulting data from a targeted customer messaging campaign, and reimburse Sense Labs for its data-transfer and messaging contributions; data collected from all Phase III monitors will be incorporated into the next evaluation report.

Status Update: Home Energy Monitoring Pilot Phase IV

Consistent with the October 16, 2020 order, WPL submitted a plan for evaluation of Phase IV of the pilot on December 1, 2020 (Docket 6680-EE-2021; PSC REF#: 400740). Evaluation activities are running concurrently with the launch of the pilot, starting with the collection of data during the initial recruitment of participants.

On February 25, 2021, WPL provided Cadmus with energy usage records for potential Phase IV pilot participants. Phase IV is designed to serve 100 income-qualified customers (with a household income below 80% of the state median income, the same criteria used by Focus on Energy for its Tier 2 programs). This phase will investigate whether low-income households present different opportunities for energy savings and/or device replacement, and whether the behavioral savings associated with home energy monitoring technology are similar across customer demographics.

A Phase IV recruitment survey has been launched to qualifying customers in five counties within WPL's service territory. The goal of this survey is to select 100 households based on income qualification and internet latency requirements (2,000/second). Cadmus will also continue to collect information on the distance between the customer's wireless router and electric panel, to help avoid the issues faced in Phase I with signal strength at the panel.

Next Steps:

Installations of 100 Phase IV Sense Monitors will begin in August; the installations have an early-to-mid autumn completion target. Sense will continue to transmit disaggregated load data for previous pilot phases, to be used in updates to ongoing analyses and in future billing analyses. An evaluation report based on data from all four phases will be filed by July 2022.

Proposed Pilot Expansion:

Evaluations of earlier phases of the Home Energy Monitoring Pilot indicate that load disaggregation technology does have the potential to produce both behavioral and device upgrade energy savings, as well as provide insight into electric loads that could be shifted off peak to help customers manage their bills on TOU rates or contribute to demand response initiatives. Phase V of the pilot is designed to test new, targeted energy-saving applications of home energy monitoring technology and deliver quantitative information on the ability of this technology to shift energy demand off peak.

The positive indications of savings that have been identified in all three original areas of interest[1] warrant a deeper look at the expanding capabilities and widening applications of customer-facing energy monitoring technologies. This will entail an expansion of efforts to investigate novel uses of this technology, such as AC fault detection, smart plug integration, electric vehicle (EV) charging applications, and demand response event messaging.

Study Design and Research Questions

Although programs often target either energy (kWh) or demand (kW) savings, these two facets of energy consumption are inextricably intertwined, particularly when it comes to devices that have sizeable impacts on both (e.g., air conditioners). To increase the probability of this pilot detecting high-use and/or faulty AC equipment and inefficient appliances, recruiting a sizeable sample of customers with EV chargers, and robustly measuring potential demand savings, WPL seeks authorization to expand the pilot to an additional 500 customers that exhibit high electric and/or gas demand. Collecting device-

[1] Residential energy savings, customer engagement and behavior, and collection of time-of-use/demand response information.

level data for these participants in combination with delivering personalized messaging will enable the following questions to be addressed:

- Can remote identification of high-use and/or faulty AC equipment encourage customers to (or give them enough advance notice to) replace these devices with high-efficiency models?
- Does the integration of device-level energy monitoring and remote smart plug control result in increased energy savings?
- When do customers with EV chargers typically charge their vehicles, and what is the magnitude of the demand, cost, and/or carbon emissions that could be saved by adjusting the timing of this charging?
- How much demand savings can be captured by a data-rich, customer-facing, combined EE/DR program approach?

The answers to these questions can help inform the design of multiple types of related programs that could be offered cost-effectively at scale. As with previous pilot filings, WPL is not proposing defined energy savings goals. The ongoing objective of this pilot is to collect and analyze data that will form the basis for establishing goals for future pilot expansions, full programs, Focus on Energy program updates, and future rates.

AC High Energy Use and Fault Detection

Recent research found that improving air conditioner performance and reliability is an area of significant untapped opportunity.[2] Using data gathered through Sense home energy monitors, a 2020 study of approximately 15,000 homes found that reducing the AC energy use of the highest 20% to match the lowest 20% of AC energy use could reduce all US residential electricity consumption by 8% (115 Terawatt hours) and an associated 52 million tons of carbon emissions, while saving customers $15.3 billion per year.

In addition to detecting high energy use, home monitoring technology is increasingly capable of identifying AC equipment faults (e.g., motor stalls) and conveying this information to users. Most HVAC replacements are currently done as emergencies when the system fails completely. By combining HVAC performance tracking, HVAC fault detection, and skilled trade allies, home monitoring insights can help customers consider an efficient upgrade before it becomes an emergency while taking advantage of available Focus on Energy incentives and programs.

We propose to install Flex Sensors (a dedicated single circuit monitoring attachment) along with Sense monitors in participating Phase V homes, to deliver precise data on HVAC energy use. This data will be used to confirm cases of high HVAC energy use as well as support existing fault detection efforts. Replacement of up to 10 inefficient and/or faulty AC units will be incentivized through the pilot.

Smart Plug Integration

Smart plugs capable of integration with the Sense app (e.g., TP Link) will be installed along with monitors during field deployment. These smart plugs will target appliances that are likely to deliver significant energy savings (e.g., window ACs, dehumidifiers, electric hot water heaters, pool pumps). Customers

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[2] Using Home Energy Monitoring Technology to Assess Residential Air Conditioning, Zavaliagkos, G. and Sastry, M. 2020

will have the ability to turn attached devices on or off remotely through tablets or smart phones. The proposed research will test the efficacy of combining device-level energy use information with the ability to remotely control appliances.

EV Charging Applications

The Phase V recruitment survey will include questions that help us determine whether potential participants own or lease an EV and their associated charging capabilities. EV-charging households will be selected for participation whenever possible. During installation, the Flex Sensor attachment will be installed on the EV charging circuit as applicable, to aid in the collection of precise EV charging data.

Through dedicated load detection, Sense can track EV charging with a high degree of accuracy. The proposed pilot expansion will leverage this capability to provide an improved understanding of customer charging patterns, setting the stage for helping customers optimize their charging based on cost and/or emissions. This information will become even more valuable over time as energy monitoring, EV charging, and smart home technology become more integrated.

Demand Response Event Testing

The Sense technology and data platform provides several opportunities to test the behavioral demand response (BDR) capabilities of home energy monitoring technology, including enhanced messaging and participant engagement. The Sense app allows for message delivery through direct notifications of events and also allows participants to monitor their performance during events. Device-level load disaggregation enables customers to understand what appliances are consuming energy and to set device-specific, real-time alerts as well as alerts on total demand during events.

Program events lasting 2-4 hours will be called to coincide with MISO system peak events during the summer. Criteria defining winter peak events as well as target event numbers will be determined by stakeholders during regular pilot check-ins. Participants will be encouraged to take action via app-delivered messaging, and program effects will be analyzed using a combination of AMI data, Sense Monitor data, and post-event participant surveys.

Event participants (i.e., the treatment group) will receive a series of event notifications delivered through the Sense app and email to communicate the timing of the event. The messages may include highlights of shiftable load equipment typically operated during peak periods, and recommendations for equipment that could be turned off to improve event performance. Additional features could be developed to communicate how successful a participant was in reducing their consumption during the event (e.g., “You used 25% less energy than usual during today’s event. Great job!”).

Cadmus will measure energy savings (kWh) and demand reduction (kW) impacts of program events. The impacts will be measured using hourly advanced metering infrastructure (AMI) data and a quasi-experimental matched control group approach. Device disaggregation data will be used to supplement the impacts measured using AMI. This data will enable investigation of device specific behaviors taken by participants to reduce consumption during events. We will attempt to measure the impact of the program on electric demand from individual device types, such as HVAC, lighting, and clothes drying as well. Pending feature development in the Sense app, future program waves could include programmatic implementation of individualized messages on specific device consumption (e.g., “The event is starting

now, save energy by turning off unneeded devices. Currently, the devices consuming the most electricity in your home are the air conditioner and clothes dryer").

Personalized Customer Engagement

This program will leverage the proactive messaging developed in prior phases to both enhance customer adoption of energy saving behaviors and to encourage participation in applicable Focus on Energy program offerings and initiatives. Customers with inefficient equipment will receive messaging that provides them with the information they need to pursue incentivized equipment upgrades. As an extension of the energy efficiency messaging, Sense will also provide messaging to educate customers on how to best use the Sense app to facilitate their load reduction during demand response events.

Participants will receive ongoing messages via email and in-app notifications throughout the program, designed to nudge participant adoption of energy efficient behaviors. The messages will focus on building awareness of current energy use, providing more detailed content and actionable steps to address common energy inefficiencies, and deeper insights about household-specific drivers of energy costs. We will incorporate lessons learned in messaging efficacy in prior phases to further enhance these notifications.

<u>Timeline and Budget for Pilot Expansion</u>

The installation of 500 monitors will, based on prior phases as well as current electrician and staff availability, require approximately one year to complete. Therefore, the proposed pilot expansion is designed as a two-year effort. AC, smart plug, and EV charging analysis will begin immediately and continue on a rolling basis as additional monitors are installed. One to three demand response events will be conducted during 2022 to test technology capabilities and fine tune our approach. A progress report will be delivered as part of the Phase IV evaluation filing by July 2022.

The budget for the expanded pilot includes the price of monitors, flex sensors, and smart plugs. Electrician, recruitment, and installation budgets are based on actual costs incurred during previous phases. Troubleshooting revisits for up to 10 monitors that have gone offline and the purchase of Wi-Fi signal extenders in cases where the Wi-Fi signal at the panel is insufficient are also included in these costs. Customer incentives are provided during recruitment, installation, and event phases to mitigate possible participation barriers and offset the time commitment for installation.

Equipment subcontractor budgets include costs associated with data transfer, equipment connection and troubleshooting, and custom app modifications and notifications. Customer engagement costs include organization and management of coordination meetings with Focus on Energy, PSC, and WPL staff, data analysis required to identify personalized participant engagement opportunities, strategic marketing services, design and execution of customer communications, encouragement, and ongoing engagement, and relevant updates to the data dashboard as a result of these activities.

Analysis and reporting costs reflect continued collection and processing of prior phase monitor data as well as maintenance and expansion of the data dashboard, and analysis and reporting resulting from enhanced engagement activities. Management costs include coordination and contracting with multiple subcontractors, meetings and coordination with PSC and Focus on Energy staff and utility filing support.

Evaluation tasks include all of those conducted for prior phases, as well as the following additions. Added evaluation costs on the process side include development and fielding of post-event surveys as well as associated customer incentives. Phase V impact analysis includes AC, EV, and smart plug data analysis, treatment and control group sample design, and the calculation of post-event savings (which may include AMI data analysis).

Cost Item	**Year 1**	**Year 2**
Kick-off Meeting	$5,640	-
Customer Incentives	$37,900	$23,000
Program Administration / Project Management	$61,165	$61,165
Sense Monitors and Flex Sensors	$150,000	-
Smart Plugs	$12,500	-
Electrician	$120,000	$34,000
Recruitment and Installation	$229,690	$62,750
DR Event Implementation	$42,900	$42,900
Sense Staff – Event Messaging and Data	$18,900	$27,000
Process Evaluation	$31,700	$56,280
Impact Analysis	$38,548	$79,292
Reporting (Interim, Final)	$18,260	$43,920
Total	**$767,203**	**$430,307**